

Critical Temperature of Water.

IN answer to Mr. Martin's letter in your last issue (p. 80), Cailletet and Colardeau found the critical temperature of water to be 365°C ., the corresponding pressure being 200.5 atmos. An account of their experiments is given in Preston's "Theory of Heat," p. 384. S. GEOGHEGAN.

Dublin, November 29.

SPECTRUM OF A METEOR.¹

THE photographs of the spectra of the stars taken at the Harvard College Observatory as part of the Henry Draper Memorial differ in two respects from those ordinarily taken elsewhere. Instead of using a spectroscope with a slit, in which but one star is photographed at a time, a large prism is placed over the object-glass of the telescope, and thus spectra of all the bright stars in the field of view are obtained. The number of stars photographed simultaneously is still further increased by substituting for the object-glass a portrait lens like that used by photographers, only larger. The field of view is in this way increased from two degrees square to ten degrees square, and a photograph is obtained of the spectra of all the brighter stars in this large region. Many thousand plates, covering the entire sky, have been taken in this way at the Cambridge and Arequipa Stations of this Observatory. All have been examined by Mrs. Fleming, and, as a result, numerous remarkable objects have been discovered. One of the latest is the spectrum of a meteor which has thus been photographed for the first time. Since it is impossible to foresee when the bright meteors will appear, or what path they will follow, a photograph will be obtained only when one happens to cross the field of the telescope. A number of trails of meteors have been obtained, both here and elsewhere, when charts of the stars were photographed, no prism being used. When the prism was in place no meteor bright enough to leave a noticeable trail has heretofore been photographed on the many thousand plates examined. At about 11 p.m. on June 18, 1897, however, when the 8-inch Bache telescope at Arequipa was directed towards the constellation Telescopium, a bright meteor appeared in right ascension 18h. 19m., declination $-47^{\circ} 10'$, and passed out of the field at right ascension 18h. 29m., declination $-50^{\circ} 30'$. The spectrum consists of six bright lines whose intensity varies in different portions of the photograph, thereby showing that the light of the meteor changed as its image passed across the plate. The approximate wave-lengths of these lines are 3954, 4121, 4195, 4344, 4636, and 4857, and their intensities are estimated as 40, 100, 2, 13, 10, and 10, respectively. The first, second, fourth, and sixth of these lines are probably identical with the hydrogen lines H ϵ , H δ , H γ , and H β , whose wave-lengths are 3970, 4101, 4341, and 4862. The fifth line is probably identical with the band at wave-length 4633, present in spectra of stars of the fifth type and forming the distinctive feature of the third class of these stars. The third line, which is barely visible, is perhaps identical with the band at wave-length 4200, contained in these stars (*Astron. Nach.* 127, p. 1).

It will be noticed that of the four hydrogen lines in the spectrum of the meteor, H δ is the most intense. This is also the case in the spectrum of α Ceti and of many other variable stars of long period. In some variables of long period H δ and H γ are equally intense, while in others H γ is the more intense. In some stars of the first type in which the hydrogen lines are bright, like γ Cassiopeiæ, the line H β is much more intense in the photographic spectrum than any of the other lines, while in the spectra of stars like P Cygni and η Carinæ, H δ , H γ , and H β are nearly equally bright. These

results show an important resemblance between meteors and stars having bright lines in their spectra, and may aid in determining the conditions of temperature and pressure in these bodies. Since bright meteors sometimes appear during the November meteoric shower, a special effort will be made to obtain photographs of them, both trails and spectra, on November 13.

November 8.

EDWARD C. PICKERING.

GEOLOGY AND SANITARY SCIENCE.

THE address recently delivered by Mr. W. Whitaker, F.R.S., before Section iii. of the Congress of the Sanitary Institute (*Journal of the Sanitary Institute*, vol. xviii., 1897, pp. 304-316), touches upon several matters of special interest at the present time. Section iii. deals with chemistry, meteorology, and geology, and Mr. Whitaker chose for his subject "Water," as being appropriate for such a triple alliance. Most important is his suggestion "that round each work for the public supply of water a certain tract of the water-bearing bed should be saved from the assaults of surface-contamination." The address was delivered before the Maidstone epidemic had occurred, but reference is made to it in a postscript, and no stronger support for Mr. Whitaker's proposal could have been given. He rightly observes that "we are yet without much information as to how far pollution may be able to reach along an underground course," but "it is here that geology comes in, for the nature of the surroundings of waterworks must be taken into account, often for some distance and to some depth." From a sanitary point of view the mapping of all the surface deposits on the six-inch scale by the Geological Survey is referred to as most necessary. A great deal has been done, but very much more remains to be done; and, as Mr. Whitaker observes, "a survey of the drifts in the London area on the six-inch scale is greatly needed."

It is a serious matter when sewage-farms and cemeteries are placed on porous strata, which are perhaps in adjacent tracts utilised for their supply of water; and yet, as Mr. Whitaker remarks, "sewage-farms and cemeteries must exist, until some other methods of disposing of waste material are not only found out, but are generally adopted."

Clearly there is need for greater control over the sites chosen for any of the purposes mentioned, and public sources of water-supply must be carefully safeguarded. The question of federation in the matter of water-supply in many localities is one to which attention is drawn, and this also is becoming urgent.

NOTES.

THE French Government, through its Embassy in London, has presented to Sir Archibald Geikie a handsome vase of Sèvres porcelain in recognition of the services rendered by him to the Geological Survey of France.

WE are pleased to hear of the foundation of the Zoological Society of Western Australia, with the object of establishing a Zoological Garden at South Perth in that colony. Mr. E. A. Le Souef has been appointed director of the new institution.

IT is announced that the Council of the Iron and Steel Institute have accepted an invitation from the Association of Swedish Ironmasters to hold the autumn meeting of the Institute next year at Stockholm. The meeting will be held in August, and, in view of the large quantities of Swedish iron and ores consumed in this country, there is no doubt that it will prove a very popular meeting. Previous autumn meetings of the Institute have been held at Belgium, France, Germany, Austria-Hungary, Spain, and the United States.

¹ Harvard College Observatory. Circular No. 20.

A BUST of Pasteur was unveiled at Melun on Monday as a memorial of his investigations on anti-anthrax serum.

THE death is announced of Dr. Harrison Allen, Emeritus Professor of Comparative Anatomy in the University of Pennsylvania.

THE Allahabad *Pioneer Mail* states that the Röntgen rays are proving of the greatest assistance in dealing with the gunshot wounds among the troops engaged on the frontier.

THE Bradshaw lecture, in connection with the Royal College of Surgeons, England, will be delivered on Wednesday, December 8, by Mr. Alfred Willett, who will take as his subject the "Correction of certain deformities by operative measures upon bones."

THE New York Zoological Society is making headway in its undertaking to convert a portion of South Bronx Park into the largest zoological garden in the world. It has the right to use the ground; it has the plans for the chief structures to be erected; it has part of the money; and it believes that the public-spirited citizens of New York will contribute the remainder of the funds necessary. In the second number of the new bulletin issued by the Society, we read: "The Society does not propose that any feature of its work shall be performed on a small or cheap scale. The Greater New York should not plan a mere menagerie on the matchless site set aside as a Zoological Park. The Society is carefully studying in this country and abroad what constitutes an ideal vivarium, and it proposes to build one worthy of a great city, or none!" As already announced, the City of New York will provide 125,000 dollars to meet the cost of preparing South Bronx Park for the reception of the Society's costly buildings and collections, and making them accessible to the public, as soon as the Society's improvement fund reaches 100,000 dollars.

At the Royal Geographical Society on December 6, Lieutenant Peary will give an account of his Arctic work. On December 13, Colonel H. W. Feilden will read a paper on recent visits by Mr. Pearson and himself to the Barents and Kara Seas and Novaya Zemlya. Mr. F. G. Jackson and Mr. Arnold Pike will also speak of their observations on the open Polar Sea of the past summer. On Friday, January 7, and Monday, January 10, at 4 p.m., two Lectures to Young People will be given by Dr. H. R. Mill; the subject being: "A Geographical Holiday through Forest, Prairie and Mountain." The lectures will be illustrated by many photographic lantern slides.

It is proposed to erect a monument of grey granite, twenty-three feet high, over the grave of Baron von Mueller in St. Kilda Cemetery, and donations are invited for that purpose by the late investigator's executors. Botanists will be pleased to know that the Baron's supplemental volume of the "Flora Australiensis," upon which he had worked for years and was preparing for the press at the time of his death, together with two volumes on his administration as Director of the Botanical Gardens, embracing a biography and complete bibliography of his writings, are to be published. His executors will feel favoured by the loan of any of his letters, or the communication of incidents in the Baron's life which his friends deem to be worthy of notice in his biography. Subscriptions for the monument, or material for the biography, should be sent to the Rev. W. Potter, "Vonmueller," Arnold Street, South Yarra, Victoria.

THE annual dinner of the Institution of Electrical Engineers was held on Wednesday in last week, and was attended by more than two hundred members and friends. In proposing

the toast of "The Scientific Societies," Prof. Ayrton compared the conditions of physical research thirty years ago with the laboratories of to-day. Lord Kelvin responded on behalf of the Royal Society, and pointed out the assistance given by that scientific Society to the advancement of natural knowledge. Sir J. Wolfe Barry replied for the Institution of Civil Engineers, and Sir James Crichton Browne on behalf of the Royal Institution. Prof. S. P. Thompson proposed the toast of "Our Guests," and the Marquis of Tweeddale and Dr. Collins (Chairman of the London County Council) replied to it. Sir Courtenay Boyle, in proposing the toast of "The Institution of Electrical Engineers," mentioned that the Board of Trade had already made 256 provisional orders for electric lighting: he hoped that electric traction would soon develop in this country. The President, Sir Henry Mance, replied to the toast, and gave a brief survey of the work of the Institution.

THE autumn meeting of the U.S. National Academy of Science was recently held at Boston. Miss Alice Bates Gould, daughter of the late Prof. B. A. Gould, who was one of the founders of the Academy, presented the sum of twenty thousand dollars, to be known as the Gould Memorial Fund, the income to be used for astronomical and mathematical purposes.—The Academy visited the Jeffersonian Laboratory at Harvard, by invitation of Prof. John Trowbridge of the Scientific School. Prof. Trowbridge exhibited his new X-ray machine. It has a voltage of 1,200,000, and with it are used 10,000 cells and 60 condensers. The condensers are charged in parallel and discharged in series by a movable framework. The spark is 48 inches long.—On the last day of the meeting, Prof. O. C. Marsh made a further contribution to the subject of the Jurassic formation of the Atlantic coast, which he has been investigating for several years. Prof. A. E. Merrill described the effects of tropical seas upon certain animals. Prof. Charles R. Cross explained experiments made by him on the wave siren for determining the pitch of musical sounds. Prof. Seth C. Chandler made a further contribution on the motion of the earth's pole. His experiments, continued for many years, warrant the statement that the area traversed by the pole does not exceed twenty feet in radius. He exhibited charts showing the varying position of the pole for seven years. Major J. W. Powell presented an hypothesis to account for movements in the crust of the earth.—After the adjournment of the meeting, members of the Academy visited the Harvard Observatory under the charge of Prof. Edward C. Pickering, and examined the apparatus and the collection of nearly 200,000 photographs of the heavens which have been made during a period of several years.—The spring meeting of the Academy will be held at Washington on April 19, 1898.

THE reports issued by the Meteorological Office on Saturday last showed that an abrupt change of the conditions of high barometric pressure, which had prevailed more or less persistently for some time past, was taking place; the wind had become more generally south-westerly, and a rise of more than 20° had taken place in the temperature, in parts of England, since the previous day. The fall of the barometer was very rapid, and by Sunday the whole type of weather had thoroughly changed; a large and important cyclonic disturbance had arrived from the Atlantic, and the centre of the storm on Sunday morning lay over the north of Scotland. South-westerly and westerly gales were blowing in most parts of our islands during Sunday, and the barometer near the centre of the storm was becoming still lower as the disturbance advanced. By 8h. a.m. on Monday the centre had travelled in a south-easterly direction across the North Sea to Denmark, causing terrific seas and northerly gales on our eastern and south-eastern coasts. The unusual track followed by the storm was probably owing to the barrier offered by the relatively higher barometric area extend-

ing over Scandinavia, while its fury was augmented by an area of high barometric pressure advancing in the rear of the storm, from the Atlantic, and thus increasing the steepness of the barometric gradients over our islands. Much damage has been wrought on our coasts by the violence of both the wind and sea, and now that the high barometric area has been displaced from over this country, further atmospheric disturbances are likely soon to reach us from the westward.

AN example of the reticulated python (*Python reticulatus*), the largest snake that has been in the Zoological Society's reptile-house for many years, and, so far as is known, the largest that has ever been there, died in the Gardens on November 14 last. It measured just over 20 feet in length. This snake was obtained in Malacca, and presented to the Society by Dr. Hampshire on August 29, 1876, and had, therefore, lived rather more than twenty years in this country. During this period it has been fed principally with ducks, of which it sometimes swallowed four or five at one meal. Its food was offered to it once a week, but it sometimes refused to eat for a month together. The specimen will be mounted for the Tring Museum. The largest snake now remaining alive in the Zoological Society's collection is a female Indian python (*Python molurus*), which measures about 18 feet in length. It was obtained by purchase in October 1889.

THE forthcoming annual report to the U.S. Congress of the Secretary of the Interior (Mr. Cornelius N. Bliss), contains much interesting information and many valuable suggestions in regard to Alaska, for which territory a government is contemplated adapted to its rapid development. In the report of the Governor of the territory, Mr. John G. Brady gives a summary of events which have transpired there during the last thirty years. He attaches great importance to the introduction of the reindeer by the Government as an important step in the solution of problems of food supply and transportation. A journey of over 2000 miles, taken with reindeer last winter by the Superintendent of the Government Reindeer Station and two Lapps, shows how well adapted this animal is to the necessities of the people there. It has this great advantage over dogs, that it can feed on the moss which grows everywhere, whereas food has to be transported for the dogs. The report states that, with care, grasses and other staple crops can be cultivated. The whole coast of Alaska, including the islands clear to the eastern end of Kadiak Island, is covered with timber of great value. Statistics regarding pelagic sealing are given, and the branding of all female pups is commended.

A WINTER weather record from the Klondike region is given by Mr. E. W. Nelson in the *National Geographic Magazine* (November). The record was obtained in the autumn and winter of the years 1880-81, at a fur-trading station on the Upper Yukon, not far from Dawson City. It covers the period from the early autumn to the opening of navigation on the Upper Yukon in spring, and is of peculiar interest at present, as showing some of the meteorological conditions in the area which is now attracting world-wide attention. The Yukon froze over on November 2, and was covered with a practically unbroken sheet of ice for more than six months. The temperature sank steadily from the end of October, and in December the lowest temperature, -67° Fahr., was noted. The lowest temperatures reached in January, February, and March were -41° , -58° , and -43° respectively. In the last-named month the effect of the returning sun became evident, the greatest range (88°) being obtained during that month. Not until the middle of May, however, did the ice start on the river, and it was some weeks before the river was free enough from floating ice to permit navigation.

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IN the *Engineer* of November 19 there is an article upon the measurement of the velocity and pressure of the wind, with illustrations of the various parts of Dines' pressure tube anemometer and of its records. Some years ago the Royal Meteorological Society appointed a committee to consider the subject of wind force, of which Mr. W. H. Dines was a member; he took great interest in the subject and carried out an exhaustive series of experiments, the chief expense of which was borne by the Meteorological Council, who were fully aware of the importance of the subject. The experiments modified to a considerable extent the values of the results obtained by the principal anemometers then in use, viz. the Robinson cup anemometer and the pressure-plate anemometer, and ultimately led to the invention by Mr. Dines of the instrument which bears his name. It consists of two independent parts, the head, with vane, which is exposed to the wind, and the recording apparatus, which may be put in any convenient, sheltered place, at a considerable distance away. These two parts are connected by means of flexible metal tubes, and the arrangement obviates the great difficulty experienced where a mechanical connection has to be maintained between them, as in the case of the two instruments above mentioned, which can never be placed far above a building. The Dines' instrument possesses many advantages over the cup and pressure-plate anemometers, and is much cheaper, while its records combine the characteristic features of both. It is now in action at many stations both in this country and abroad, and will, no doubt, throw considerable light on questions about which there has hitherto been much uncertainty.

THE last number of the *Annales de l'Institut Pasteur* contains the report for the past year of the work carried out at the Station Pasteur de Tiflis. No less than 242 persons of very diverse nationalities received the antirabic treatment; 5 were Persians, 4 Greeks, 32 Armenians, 5 Tartars, 10 Germans, 110 Russians, &c. Bites from dogs were principally recorded; but there were also 6 from horses, 2 from cats, and 1 from a donkey. The mortality, as estimated according to the Pasteur method, only amounted to 0.45 per cent. An extremely remarkable case is specially recorded, in which a station-master was treated for hysteria, he having no recollection of ever having been bitten by any animal whatever. On being, however, repeatedly pressed, he recalled having been bitten, a year and seven months previously, by a dog in the chest. The characteristic symptoms of rabies soon declared themselves; the patient was not, however, treated for hydrophobia, and he died. Subsequent inoculations proved that he had succumbed to undoubted rabies. So prolonged a period of incubation for hydrophobia is, we believe, unknown. Experiments were conducted at the station to determine the action of Röntgen rays on the virulence of rabid marrows, and it was found that the virulence was diminished slightly by considerable exposure to these rays. Researches were also carried out to ascertain how long rabid marrows can be preserved in glycerine and water without losing their virulence, and the period, Dr. Frantzius tells us, is a longer one than Roux, Nocard, and other investigators have thought.

THE so-called canning industry has made such vast strides all over the world, and notably in America, that it is not surprising that this method of preserving foods should form the subject of inquiry at the hands of the bacteriologist. When we learn that in Baltimore alone 1,250,000 bushels of oysters are annually canned, and that the United States is responsible for 120,000,000 cans of tomatoes, and of other articles, such as fish of various kinds, and fruits, &c., in similarly large numbers, it is remarkable that Messrs. Prescott's and Underwood's paper, "Micro-organisms and sterilising processes in the canning industry," published in the *Technology Quarterly*, should be the first contribution to so important a subject. These gentlemen have

specially studied the bacterial flora of canned clams and lobsters which have broken down, or, in other words, been imperfectly preserved. In every case where "spoiling" had occurred, bacteria were present in large numbers, whilst in no instance were any discovered in sound cans. Sometimes only a single variety, or a pure culture of a particular microbe, was found in unsound cans, but usually the latter contained a mixture of several species. Nine different bacteria were selected and isolated for subsequent study, both as regards their macroscopic and microscopic appearances; two of these were cocci, the remainder bacilli forms. These bacteria were afterwards inoculated into the contents of sound cans, with the result that the latter invariably decomposed, whilst experiments were also made to test the method of applying heat to canned articles which would most effectually destroy the chances of these micro-organisms surviving and spoiling the contents. An account of the numerous experiments carried out by the authors on this highly important commercial side of the inquiry will be published later; meanwhile their investigations go to show that, given a proper control of the temperature, it is possible to preserve clams and lobsters with absolute certainty, and in a more perfect condition than has hitherto been possible.

THE *Journal de Physique* for November contains a specially good collection of abstracts of physical papers, in addition to an important paper by M. Gerrit Bakker, on the thermodynamic properties of liquids with simple molecules, and a note by M. J. Schurr, on electric resistance and self-induction.

FROM Mr. F. W. Frankland, of New York, we have received several papers on the "Theory of Discrete Manifolds," dealing with the postulates of Euclidian geometry and their hypothetical counter-propositions, space-curvature, and the geometric axioms. Almost concurrently with these essays, Signor G. Veronese gives in the *Atti dei Lincei* a disquisition on the postulate of continuity, in which he arrives at certain conclusions contrary to the views of Schönflies.

SOME ten years ago, Weber discovered that a heated body begins to emit visible radiations at a lower temperature than that at which it exhibits the well-known glow of red heat. This "grey-glow," as it has been termed, has been investigated from a physiological standpoint by Herr O. Lummer (*Annalen der Physik und Chemie*, 62). According to the author's theory the observed appearances are due to the different susceptibilities of the rods and cones of the retina to light of varying intensity, the grey-glow being perceptible only to the rods, while the red-glow stimulates the cones. It is proposed to make observations of the lowest temperature at which luminosity occurs. Herr Lummer expresses the view that this temperature depends in some degree on the area of retinal surface exposed to the radiations.

FROM a series of investigations on the temperature-coefficient of the potential of the calomel electrode (*Proceedings of the American Academy of Arts and Sciences*, xxiii. No. 1), Mr. Theodore William Richards draws the following conclusions: (a) The temperature-coefficient increases with the dilution of the electrolyte; (b) the kation of the electrode influences the result by affecting the degree of dissociation of the chloride in solution; (c) both of these effects may be approximately computed by a simple logarithmic formula based upon Nernst's hypothesis; (d) the accuracy of the results is, however, affected by at least one important modifying influence, the "catalytic" decomposition of mercurous chloride into mercuric chloride and mercury; (e) this side reaction is responsible for the slight inconstancy of the normal calomel electrode; (f) the "decinormal electrode" is much more uniform in its behaviour than the normal, and hence for some purposes might be a more useful means of

measuring potential differences; (g) hydrochloric acid and ammoniac chloride are anomalous in their behaviour.

AMONG recent contributions to systematic botany are "North American Lemnaceæ," by Mr. R. C. H. Thompson, all four genera which comprise the order being represented; and "Contributions to the Flora of Queensland," by Mr. F. M. Bailey, in which two new species of *Nepenthes* are described and figured.

THE *Botanical Gazette* states that another botanical journal has entered the field as a popular magazine in America. The *Asa Gray Bulletin* has ceased to be the organ of the Agassiz Association, and has entered upon a larger field. It will in future be published monthly, at Washington, D.C.

THE last issue (Appendix 1., 1898) of the *Kew Bulletin of Miscellaneous Information* consists of a list of seeds of hardy herbaceous plants, and of trees and shrubs (mostly ripened at Kew during 1897), available for exchange with colonial, Indian, and foreign botanic gardens, as well as with regular correspondents of Kew.

Two useful publications recently received from the U.S. Department of Agriculture (Division of Vegetable Physiology and Pathology) are "The Bermuda Lily Disease," by Mr. A. F. Woods, attributed by the author to a variety of causes, chiefly negligent horticulture; and "Notes on the Grasses and Forage Plants of Iowa, Nebraska, and Colorado," by Prof. L. H. Pammel, illustrated by a number of excellent woodcuts. Dr. E. F. Smith sends us a reprint from the *Centralblatt für Bakteriologie, Parasitenkunde, und Infektionskrankheiten* (in English), on *Pseudomonas campestris*, the cause of a brown rot in cruciferous plants caused by a Schizomycete, hitherto known as *Bacillus campestris*. Having only a single long polar flagellum, the author regards it as belonging to Migula's genus *Pseudomonas*. The life-history and effects of the parasite are described in detail.

THE second edition of a series of "Laboratory Tables for Qualitative Analysis," drawn up by the demonstrators in chemistry of the Owens College, Manchester, has been published by Mr. J. E. Cornish. The tables show in a systematic way, how the student should proceed to examine a solid substance, to make a preliminary examination for acids, to examine acid mixtures, or make a preliminary examination of an organic substance. Following these instructions are tables for the various groups of metals. Each schedule or table occupies one sheet (except the two first tables, which cover two sheets each). The tables are thus handy for use in chemical laboratories where simple analysis has to be carried on, though the demonstrators themselves would often prefer to give the laboratory work a more educational value if they were at liberty to do so, or if time enough was allowed them. Where a course of qualitative analysis is a part of the curriculum, and the demonstrator has thirty or forty students to look after, the tables should be found useful, for they will save the student from worrying his instructor with unnecessary questions.

THE additions to the Zoological Society's Gardens during the past week include a Common Marmoset (*Hapale jacchus*) from South-east Brazil, presented by Mr. G. Willison; an African Brush-tailed Porcupine (*Atherura africana*) from West Africa, presented by Captain W. C. Woollett; a Flat-backed Terrapin (*Cyclemmys platynoia*) from Johore, Malay Peninsula, presented by Mr. S. S. Flower; a Leopard Tortoise (*Testudo pardalis*) from South Africa, presented by Miss E. Harold; a Hawk's-billed Turtle (*Chelone imbricata*) from the East Indies, two Scorpion Mud Terrapins (*Cinosternon scorpioides*) from Guiana, eleven Dumeril's Grieved Tortoises (*Podocnemis dumeriliana*) from South America, presented by Dr. J. Bach; a Smooth

Snake (*Coronella austriaca*) from Hampshire, presented by Mr. E. Penton; a Mozambique Monkey (*Cercopithecus pygerythrus*, ♂) from East Africa, a Red Deer (*Cervus elaphus*), European, deposited; two Bridled Wallabys (*Onychogale frenata*) from Australia, an Electric Eel (*Gymnotus electricus*) from South America, purchased.

THE illustrations for Profs. Parker and Haswell's forthcoming "Text-book of Zoology" have been drawn by Mr. M. P. Parker, and not Mr. N. J. Parker, as announced last week.

OUR ASTRONOMICAL COLUMN.

THE VARIABLE STAR α CETI (MIRA).—For many years past the brightness of this star at maximum has not come up to expectation, neither has its time of maximum occurred when predicted, a fact which might be accounted for by an irregularity of some twenty-five days either one way or the other. This year, however, as observed on November 28 by Mr. Shackleton, it was already brighter than γ Ceti (3.38), and nearly as bright as α Ceti (2.44) {Oxford Uranometria}, so that its magnitude will be about 2.9. Another observation on November 29, made at the Solar Physics Observatory, South Kensington, by the same observer and Mr. Butler, gave its brightness equal to γ Eridani (2.8) (U.A.) (3.0 H.P.).

The predicted and observed maxima for the last three years are as follows:—

	Predicted (Observatory Companion).	Observed.	Mag.
1895 ...	December 9 ...	February 27 ...	3.8
1896 ...	November 3 ...	February 1 ...	3.5
1897 ...	November 9 ...	?	(2.9)?

From the observations of last year and the period of 332 days, it should be at its maximum about December 30, so that it may still be expected to increase in brightness, though its light curve is very irregular near maximum.

THE COMING TOTAL SOLAR ECLIPSE.—Owing to the presence of the plague in some parts of the country near the line of central totality, several parties intending to observe the total solar eclipse of January 22 next have had to make new arrangements. At present the following seems to represent the locations of the several parties on the central line. The most western station, Viziadurg, will be occupied by Sir Norman Lockyer with his party, backed up by the officers and crew of one of Her Majesty's ships. Karad, the next station to the east, lying on the Southern Mahratta railway, will be the place of observation by Prof. Michie Smith with his party from the Madras Observatory. Prof. Naegamvala with his followers will also probably adopt this region for work. Further to the east lies Talni, where Mr. Newall, Captain Hills, and a party from the British Astronomical Association will be stationed. Where the central line of totality cuts the road between Nagpur and Seoni, Dr. Copeland will take up his station, while about 150 miles further along the track, at Sohagpur, the Astronomer Royal and Prof. Turner will be stationed. Still further eastward, at Buxar on the Ganges, will be located two parties—one consisting of a second section of the British Astronomical Association, and the other the main party of the Great Indian Trigonometrical Survey. It is also likely that the Japanese astronomers will be in this neighbourhood. At another station, still further along the line, it is stated that the Fathers of the St. Xavier's College, Calcutta, will make observations. Profs. Campbell, Schaeberle, Todd, and not improbably M. Deslandres, will be present somewhere on the central line, but the actual positions they will take up are not yet definitely known.

SYSTEMATIC OBSERVATIONS OF OCCULTATIONS.—Herr H. Batterman has recently published (*Astr. Nach.*, 3457-8) the individual observations of a very complete set of occultations of stars by the moon, numbering altogether 641. The instrument he employed was a Merz refractor of 6 inches aperture and 8 feet focal length, and was set up at the Berlin Observatory. The object of these observations was to determine the parallactic inequality of the moon, and thence the parallax of the sun. For such an undertaking it was necessary to make observations on as many days as possible, especially near the time of full moon; the observations had, further, to be regular as

regards immersion and emersion, and homogeneous as much as possible over the lunar orbit. Herr Batterman was handicapped very considerably by the local conditions of Berlin, and by being restricted as regards his visible horizon; but, nevertheless, he was able to secure a considerable number of observations in the two and a quarter years he devoted to them. This communication contains simply the individual observations, but he hopes at some future date to publish the results when the large work of computation has been completed.

THE VARIABLES S CEPHEI AND T URSE MAJORIS.—Mr. C. E. Peek, who is the owner of the Rousdon Observatory, Devon, has just published two very interesting series of observations relating to the light changes of the variables S Cephei and T Urse Majoris. All the observations were made with a Merz 6.4-inch equatorial refractor, and each is the mean of fine visual comparisons with stars that are seen in the same field of view as the variable. The author does not, however, state his actual method of observing, but we presume that this will be included in the introduction (No. 1) which he proposes to issue subsequently. In addition to the list of the individual observations, Mr. Peek has plotted the curves representing the light changes during this period of ten years (1887-1896 inclusive) over which the observations extend. These curves do not appear to have been smoothed, so that they represent the observed light fluctuations. In the case of T Urse Majoris, there is a very suggestive brightening about the time of minimum in nearly all the curves of this variable here drawn, and it would be interesting to know if other observers have recorded it.

SOME SYSTEMS OF METEORS.—Prof. Th. Bredikine contributes to the *Bulletin* of the St. Petersburg Academy (5th series, vol. v. No. 5) an investigation with the object of determining which member or members of our solar system have a disturbing action on those systems of meteors which the earth passes through in her revolution round the sun. The disturbing agents taken into account are: the action of some major planet, that of the earth, which is somewhat of the second order, and last, but not least, that of the sun, whose power acts in two ways, namely, first by attraction, and secondly by creating great disturbances in the nucleus. In nearly all cases the sun's effect is predominant, especially when the distance at perihelion passage is small, but sometimes a near approach to one of the major planets is very marked. Prof. Bredikine has previously shown that from an examination of comets' tails the force of projection at the times of outbursts is sufficient to convert the orbits of several of the composing particles from parabolic to elliptic of short period. He assumes that all meteor streams contain particles originally belonging to comets which passed through the solar system, and lost matter by disturbing actions of the members of this system. Employing as a starting-point the positions of some of the more prominent radiant points, as given in the catalogue published by Mr. Denning in the *Monthly Notices* (May 1890), he investigates the probable disturbing agent in each case. Most of the meteor streams dealt with have, according to this investigation, resulted from large disturbances at the nucleus caused by the sun itself; among these are the Leonids, Quadrantides, Geminides, Aquarides, &c. The Orionides owe their presence to the planet disturbing influence of Jupiter, while the Lyrids are due to that of Saturn.

COMET PERRINE (OCTOBER 16).—The ephemeris of comet Perrine, which we have recently given in this column, begins now to indicate variations from the observed place. Herr Möller (*Astr. Nachr.*, No. 3459) has therefore determined new elements from the variation of proportionate distances, using the observations made on October 16, Mount Hamilton; October 24, Hamburg; and November 1, Arcetri, Florence. The following are the new computed positions:—

Ephemeris, 12h. Berlin M.T.

1897.	R.A.	Decl.	log r .	log Δ .	Br.
	h. m. s.	°			
Dec. 2 ... 18	10 37 ...	+54 56.5 ...	0.1334 ...	0.0539 ...	0.7
3 ...	10 4 ...	54 25.0			
4 ...	9 33 ...	53 54.6			
5 ...	9 4 ...	53 25.4			
6 ...	8 38 ...	52 57.2 ...	0.1325 ...	0.0704 ...	0.6
7 ...	8 14 ...	52 30.0			
8 ...	7 52 ...	52 3.8			
9 ...	7 31 ...	51 38.5			
10 ... 18	7 12 ...	+51 14.2 ...	0.1325 ...	0.0858 ...	0.6